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(54) Method of and apparatus for manufacturing a mat for building purpose.

(57) A method of and an apparatus for drying/curing a dry material such as a mat of fibrous or powder material as may be used for building purpose as well as a non-dry material such as a thermosetting resin are disclosed. The disclosure relates to the sealing function during the drying/curing step. The apparatus comprises a heating and blowing mechanism for drying/curing a mat as it is being conveyed by a conveyor mechanism including pair of upper and lower conveyors, and shield mechanism for shielding between the conveyor mechanism and the heating and blowing mechanism. The shield mechanism includes wire brushes on blowing boxes of the heating and blowing mechanism for abutment against caterpillar plates of forward runs of respective conveyors to seal between the caterpillar plates of the forward runs and the blowing boxes. Any powder or particles which may be developed during the drying/curing step is trapped by the wire brush, which is then effective to prevent a leakage of a hot air, thus assuring an even pressure of hot air supplied. The wire brushes are disposed in a plurality of rows and divided into stationary and movable ones. By moving the movable wire brushes for movement toward or away from abutment against the caterpillar plates of the forward runs, selected flexible caulking members are operated to provide a variable shielded width.

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(54) Method of and apparatus for manufacturing a mat for building purpose

Verfahren und Vorrichtung zur Herstellung einer Matte für Bauzwecke

Procédé et dispositif de fabrication d'un tapis pour la construction

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- **PATENT ABSTRACTS OF JAPAN vol. 16, no. 549 (M-1338)18 November 1992 & JP-A-4 203 883 (SANEI KISETSU) 24 July 1992**

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Description

FIELD OF THE INVENTION

BACKGROUND OF THE INVENTION

The invention relates to a method of and an apparatus for drying/curing dry materials such as mats of fibrous or powder material as may be used for building purpose as well as a non-dry material such as thermosetting resin, and in particular, a method of and an apparatus for manufacturing a mat used for building purpose which is characterized in the seal for hot air thereof during the drying/curing step.

DESCRIPTION OF THE PRIOR ART

Generally, a molded mat used for building purpose is subject to a drying or curing step in a drier before it is finished to a final product. A band drier is typically used at this end.

A conventional band drier comprises a pair of oppositely disposed, upper and lower conveyers, each of which is housed in an upper or lower oven. Each conveyor comprises an endless chain disposed to run around a pair of sprockets and having a plurality of caterpillar plates with ventilation openings formed therein mounted thereon. A drive sprocket is driven for rotation by a drive source in each of the conveyors, and the mat is held between and coveyed by the forward runs of caterpillar plates of the respective conveyors as the sprockets rotate.

Heating and blowing mechanism is disposed above and below the caterpillar plates of the forward runs of the upper and lower conveyors, and operates to introduce a hot air from a heated source into the associated oven by means of a blower, and to cause it to circulate through the caterpillar plates of the respective forward runs and the mat being conveyed, thereby drying/curing the mat. The heating and blowing mechanism comprises a series of alternately arranged high and low pressure blowing boxes which are disposed along the direction of conveyance between the caterpillar plates of the forward and the return run of each conveyor, and a path for the hot air is defined by a high pressure blowing box and a corresponding low pressure blowing box of respective conveyors. The upper conveyor and upper blowing boxes are vertically adjustable in accordance with the thickness of the mat.

A conventional band drier may be exemplified by an arrangement disclosed in U.S. Patent No. 4,028,051 in which narrow paths are provided between the caterpillar plates and the blowing boxes in order to increase a pressure differential between the high and the low pressure blowing box so that the passage of the hot air through the mat is facilitated, thereby assuring an even drying/curing of both the front and the rear side of the mat.

These narrow paths are provided to prevent damages by thermal distortion occurred in a sliding movement between a fixed side and a movable side. Such provision of narrow paths inevitably makes a clearance between the caterpillar plates and the blowing boxes, thus inviting a leakage of hot air from the heating and blowing mechanism. To reduce the leakage, it is necessary to make the clearance as small as possible. However, such a clearance in the narrow paths has to be provided at the range from 5 mm to 10 mm at least. It is said in general that according to such manner, 10 to 20 percent of the hot air leaks out as ineffective hot air.

The hot air usually assumes an elevated temperature in a range from 100° C to 350° C, and accordingly, the narrow paths may be degraded by thermal effect or may be subject to a thermal distortion to enlarge the leak clearance, whereby the hot air may find its way out of the circulation path into the oven to allow the ingress of dusts produced by the mat material into the drive section of the conveyor, causing malfunctioning thereof. In addition, a failure to maintain a given hot air pressure causes a reduced efficiency, or may cause an inconvenience that the mat cannot be dried and cured in an even manner.

In addition, a predetermined and fixed interval between the narrow paths inevitably determines the effective width of the cured mat to a given length. For example, when a mat which is shorter in width than the effective width of the caterpillar plates is conveyed, the hot air can feely pass through a part of the caterpillar plates on which the shorter mat is not in contact with, thus inviting a reduction of the hot air for circulating through the mat. Accordingly when the cured mat is cut to the size of the desired final product. a wasteful edge may be produced during an edge trim step, thus decreasing the production efficiency.

A prior art that is concerned with this problem is that in PATENT ABSTRACTS OF JAPAN, vol. 16, no. 549 (M-1338) 18 November 1992 that discloses an apparatus as described above but additionally having stationary caulking members, in the form of wire brushes, disposed outside the path of converyance of the mat on both sides of said path and disposed between the upper conveyor and a blower boxs thereunder. It is stated that these stationary caulking members catch dust generated by the mats; and it is clear from the accompanying drawings that the stationary caulking members will also serve to limit the flow of hot air through the caterpillar plates, on which the mat being dried rests, to the width defined between the stationary caulking members. It is also clear from the drawings that the stationary caulking members will assist in preventing a leakage of hot air from the clearance between the underface of mat conveyor and the hot air blowing box thereunder.

This prior art additionally discloses, in the drawings, further caulking members under the mat conveyor that define between them a mat drying width that is less than the width defined by the aforesaid stationary caulking members, said further caulking members being swing-

able from a non-shield setting to shield setting thus offering the manufacturer of the mats a variable shield width.

SUMMARY OF THE INVENTION

It is an object of the invention to provide a method of and an apparatus for manufacturing a mat for building purpose, which method and apparatus is an improvement on that disclosed in the aforesaid U.S. Patent No. 4,028,051 and an improvement over that disclosed in the aforesaid PATENT ABSTRACT OF JAPAN.

The method of the present invention is as defined in the accompanying Claim 1 that has been divided into a two part form based on the assumption that the aforesaid PATENT ABSTRACT of JAPAN is the nearest state of the art.

The apparatus of the present invention is as defined in the accompanying Claims 2 to 5, Claim 2 of which has been divided into a two part form on the same basis as has been applied to Claim 1.

Other objects and advantages of the invention will become apparent from the following description with reference to the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a longitudinal section of an apparatus for manufacturing a mat for buidling purpose according to one embodiment of the invention, taken along the direction of conveyance;

Fig. 2 is a top view, partly broken away, of the apparatus shown in Fig. 1;

Fig. 3 is a front view of the apparatus;

Fig. 4 is a cross section of the apparatus shown in Fig. 2, taken along the line IV-IV;

Fig. 5 is an illustration of a heating and blowing mechanism of the apparatus;

Fig. 6 is a transverse cross section of a shield mechanism of the appparatus;

Fig. 7 is a transverse cross section of part of the shield mechanism shown in Fig. 6;

Fig. 8 is a cross section of the shield mechanism shown in Fig. 7, taken along the line VIII-VIII; and

Fig. 9 is an illustration of a caulking member rocking assembly of the shield mechanism.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

Referring to the drawings, the invention will now be described in terms of an embodiment shown. An apparatus for manufacturing a mat for building purpose comprises a conveyor mechanism A acting as conveying means, a heating and blowing mechanism B acting as heating and blowing means which dries and cures a mat as it is conveyed by the conveyor mechanism A, and a shield mechanism C acting as shield means to provide an isolation between the conveyor mechanism A and the heating and blowing mechanism B.

As shown in Figs. 1 to 3, the conveyor mechanism A comprises a lower conveyor 1 and an upper coneyor 2, which are received in an oven 30, respectively. The lower conveyor 1 comprises a pair of lower sprockets 4, 6 connected to a drive source 22, a pair of follower sprockets 3, 5 and a pair of endless lower chains 7, 8 extending across the driven sprockets and the follower sprockets, with a multiplicity of caterpillar plates (strut plates) 11 having ventilation openings 10 perforated therein extending across the endless chains 7, 8. Similarly, the upper conveyor 2 comprises a pair of upper sprockets 14, 16 connected to the drive source 22, a pair of follower sprockets 13, 15, and a pair of endless upper chains 17, 18 extending across the driven sprockets and the follower sprockets, with a multiplicity of caterpillar plates having ventilation openings 10 perforated therein mounted across the pair of upper chains 17, 18. In addition, the upper conveyor 2 is vertically elevatable together with associated upper high pressure and low pressure blowing boxes 33, 34 by means of an upper conveyor elevating unit 31, shown in Fig. 3.

As shown in Fig. 4, each of the caterpillar plates 11, 21 comprises a plate section 111, 121 in which a plurality of ventilation openings 10 are formed, and the underside of the plate section 111, 121 is formed with a plurality of reinforcing ribs 11c, 21c which extend parallel to the direction of conveyance. Of these reinforcing ribs 11c, 21c, a reinforcing rib 221c on the upper conveyor 2 which is located outermost and a corresponding reinforcing rib 211c of the lower conveyor 1 are vertically aligned to assume crosswise equivalent positions. The reinforcing ribs 221c, 211c are respectively provided to be slightly offset in the direction of width by turns each other in corresponding to the front and rear plate sections 111, 121 in order to avoid an interference between the front and rear reinforcing ribs 11c, 21c when the caterpillar plates 11, 21 are turning reversaly, thus allowing a smooth turn thereof. Reinforcing ribs 11c', 11c'', 111c', 111c'' of the lower conveyor 1 are symmetrically disposed with respect to a center line 0_1 and are also located at slightly offset positions in width on each of the front and rear plate sections 111, 121. Those portions of the caterpillar plates 11, 21 which face each other define forward runs 11a, 21a while the remainder define return runs of caterpillar plates 11b, 21b. A reduction gearing 23 is shown to reduce the speed with which the conveyors 1, 2 are driven in order to control the speed of conveyance in accordance with the material and the thickness of a mat being processed.

As the respective conveyors 1, 2 are driven and the drive is transmitted through the reduction gearing to the lower sprockets 3, 5 and the upper sprockets 13, 15 to drive them for rotation in the opposite directions to each other, a mat M for building purpose which is conveyed from the outside is introduced into an opening defined between the foward runs of the caterpillar plates 11a,

21a to be conveyed as held sandwiched therebetween.

The heating and blowing mechanism B is shown in Fig. 5 as comprising a heating blower unit 35 which blows heated air supplied from a heated source, not shown, and high pressure and low pressure blowing boxes 33, 34. As shown in Figs. 1 and 2, the high pressure and the low pressure blowing box 33, 34 are alternately disposed along the direction of conveyance between the forward run of caterpillar plates 11a, 21a and the return run of caterpillar plates 11b, 21b of each conveyor 1 or 2 so that the hot air from the blower unit 35 may be admitted to the oven 30. By defining a path for the hot air by utilizing the high pressure blowing boxes 33 and the low pressure blowing boxes 34 of the respective conveyors, the heating and blowing mechanism B constitutes a hot air supply system which causes the hot air to circulate between the heated blower unit 35 and the respective blowing boxes 33, 34. The hot air delivered from the blower unit 35 is fed from the high pressure blowing box 33 to pass through the caterpillar plates 11a, 21a of the forward runs and through the mat M being conveyed into the low pressure blowing box 34 which has its opening located opposite to the high pressure blowing box 33.

As shown in Fig. 9, the upper high pressure and low pressure blowing boxes 33, 34 disposed in the upper conveyor 2 has movable supply and exhaust openings 133b, 134b respectively which are vertically elevatable to and connected with each of the other supply and exhaust openings 133a, 134a of a fixed side of the heating and blowing mechanism B. The movable supply and exhaust openings 133b, 134b and the fixed supply and exhaust openings 133a, 134a are formed with plates 135, 136 extending upwardly and downwardly which are slidably contact against each other so as to be connected with the movable openings 133b, 134b and the fixed openings 133a, 134a. As shown in Fig. 1, exhaust ducts 30a, 30b are disposed on the upper portion of the oven 30. When a waste gas leaked out from both lateral side faces of the mat M during the drying/curing step is accumulated inside the upper side of the oven 30, the waste gas is exhausted outside through the exhaust ducts 30a, 30b.

As shown in Figs. 5 and 6, the upper conveyor elevating unit 31 is provided on the oven 30 to extend through its upper portion. The upper conveyor elavating unit 31 comprises jacks 31a disposed on the upper portion of the oven 30 and upper conveyor supporting rods 31b extending downward from the jacks 31a. The upper conveyor supporting rods 31b, which are firmly connected with the upper conveyor 2 and the upper blowing boxes 33, 34 included in the upper conveyor 2, vertically elevate them in responsive to the actuation of the jacks 31a.

In accordance with the invention, a shield mechanism C which prevents a leakage of the hot air from between the conveyor mechanism A and the heating and blowing mechanism B to the outside is provided within the heating and blowing mechanism B. Referring to Figs. 6 and 7, the shield mechanism C comprises first wire brushes 41 which are provided as stationary flexible caulking members, second and third wire brushes 240, 340 which are provided as movable flexible caulking members located inward of the first wire brushes 41 for the lower conveyor 1 at different crosswise positions and extending along the direction of conveyance, and a plurality of rocking assemblies 250, 350 for causing an independent rocking movement of the second and the third wire brushes 240, 340 for movement toward and away from abutment against the caterpillar plates of the forward run 11a of the lower conveyor 1.

Referring to Fig. 6, the first wire brushes 41 are disposed at the opening edges 33a, 34a of the blowing boxes 33, 34, and abut against the reinforcing ribs 211c, 221c of the caterpillar plates 11a, 21a of the respective forward runs so as to fill the clearances between the blowing boxes 33, 34 and the caterpillar plates of the forward runs 11a, 21a. Referring to Fig. 7, the second and the third wire brushes 240, 340 are disposed inwardly of the first wire brushes 41 associated with the lower conveyor 1 at different crosswise positions so as to avoid an interference of each other, and extend along the direction of conveyance. In addition, the second and the third wire brushes 240, 340 are independently driven for rocking movement by the rocking assemblies 250, 350 so as to be movable toward or away from abutment against the plurality of reinforcing ribs 11c', 11c", and 111c', 111c" of the caterpillar plates 11a of the forward run.

Considering the second wire brush 240, by way of example, it is located inwardly of the first wire brushes 41 and extends along the direction of conveyance, as shown in Figs. 7 and 8. The rocking assembly 250 causes it to be rocked inwardly, whereby such brush can be moved toward or away from abutment against the plurality of reinforcing ribs 11c', 11c" of the caterpillar plates 11a of the forward run. These wire brushes 41, 240 and 340 are designed to provide a self-sealing function by containing fine air gaps in its interior in which powder and particles (dusts) which may be developed during the drying and curing step may be trapped.

To illustrate the plurality of rocking assemblies 250, 350, Figs. 8 and 9 illustrate one of them, the rocking assembly 250, for example, as comprising an air cylinder (or oil cylinder) 251 acting as an actuator, a rod 252 connected to the air cylinder 251 and extending through the oven 30 and reciprocable crosswise of the lower conveyor 1, a rocking arm 253 having its one end rockably connected to the rod 252 and fitted over an arm shaft 253b, and a rocking plate support member 253c also fitted over the arm shaft 253b and rocking integrally with the rocking arm 253. In addition, the rocking assembly 250 includes a rocking plate 254 which is mounted on the rocking plate support member 253c so as to extend along the direction of conveyance, with the second wire brush 240 mounted on the upper end of the rocking

plate 254. A seal plate 255 is mounted on the rocking plate 254 so as to block the clearance between the opening edges 33a, 34a of the blowing boxes 33, 34 and the second wire brush 240.

Before the air cylinder 251 is actuated, the rocking assembly 250 causes the second wire brush 240 to be completely erect or upright so that it may be brought into abutment against the reinforcing rib 11c' of the caterpillar plate 11a of the forward run, thus sealing between the forward run 11a and the blowing boxes 33, 34. When the air cylinder 251 is actuated to cause the rod 252 to be displaced crosswise outwardly to thereby rock the rocking plate 254 integrally with the rocking arm 253, the second wire brush 240 which assumed an erect position is gradually turned or inclined inwardly for abutment against the reinforcing rib 11c" of the caterpillar plate of the forward run 11a. As the air cylinder 251 continues to be actuated to cause a further displacement of the rod 252 outwardly, the second wire brush 240 will be toppled or laid down, and thus is moved away from either one of the reinforcing ribs 11c', 11c".

The other rocking assembly 350 is constructed in the similar manner as the rocking assembly 250 mentioned above. Thus, it comprises an air cylinder 351, a rod 352, an arm shaft 353b, a rocking arm 353, a rocking plate support member 353c, a rocking plate 354 and a seal plate. However, the rod 352 has a different length dependent on the crosswise position of the third wire brush 340, and is vertically offset from the corresponding rod of the rocking assembly 250 in order to avoid an interference with the rod 252, the rocking arm 253 and the rocking plate 254 of the rocking assembly 250.

By causing a rocking motion of the second or third wire brushes 240, 340 to choose a shielded width as measured between given reinforcing ribs 211c, 11c', 11c", 111c' and 111c", the rocking assemblies 250, 350 are independently operated so as to bring either one of the first to the third wire brushes 41, 240, 340 into abutment against only the selected reinforcing ribs. For example, when the second wire brushes 240 are chosen to select a shielded width across the reinforcing ribs 11c', 11c', the rocking assembly 250 is operated to erect the second wire brush 240 to its upright position for abutment against the reinforcing rib 11c' of the caterpillar plate of the forward run 11a while the air cylinder 351 of the other rocking assembly 350 is operated to topple the third wire brushes 340 completely inwardly so that the latter may be moved away from the reinforcing ribs 111c', 111c" of the caterpillar plates of the forward run 11a.

When choosing a shielded width defined by the first wire brushes 41, all of the air cylinders 251, 351 of the rocking assemblies 250, 350 are actuated to cause the second and the third wire brushes 240, 340 to be moved away from the reinforcing ribs 11c', 11c", 111c', and 111c", allowing only the first waved wire brushes 41 to be maintained in abutment against the reinforcing ribs 211c.

At this time, the second and the third wire brushes 240, 340 are only associated with the lower conveyor 1, but the hot air which is pumped to pass through the mat M is allowed to pass vertically therethrough, but hardly pass in the horizontal direction and allow a leakage of only the surplus waste gas, thereby avoiding the need to take the lateral path of the hot air from the lateral sides of the mat into consideration. This allows the sealing function to be fully exercised when the second and the third wire brushes 240, 340 are associated with the lower conveyor 1 alone. Once a waste gas is accumulated inside the oven 30, the waste gas is exhausted outside through the exhaust ducts 30a, 30b.

A method of manufacturing a mat for building purpose will now be described based on the operation of the apparatus mentioned above. Initially, an upper conveyor elevating mechanism 31 is used to adjust the upper conveyor 2 and the upper blowing boxes 33, 34 vertically in accordance with the thickness of a desired mat M, thus adjusting the inlet clearance defined between the caterpillar plates 11a, 21a of the both forward runs.

The effective width across which the mat M is to be subject to a drying/curing step is determined in accordance with the width of the mat M or a desired cutting pattern thereof, and suitable reinforcing ribs 11c are chosen in accordance with the effective width. By way of example, when the effective width is determined as corresponding to the shielded width across the reinforcing ribs 11c", 11c", the air cylinder 251 of the rocking assembly 250 is actuated to cause a crosswise outward displacement of the rod 252 through a given stroke, thus rocking the rocking plate 254 to bring the second wire brush 240 into abutment against the reinforcing rib 11c", whereupon it is stopped.

The air cylinder 351 of the other rocking assembly 350 is then actuated to topple the third wire brushes 340 inwardly, thus moving them away from the reinforcing ribs 111c', 111c". Since the effective width is selectable in accordance with the width of the mat M or a cutting pattern thereof by independently operating the rocking assemblies 250, 350 and choosing the desired reinforcing ribs 211c, 221c, 11c, 11c", 111c' and 111c", an area which is subject to an edge trim can be reduced, thus allowing the mat M to be manufactured in an efficient manner.

A drive from the drive source 22 is transmitted to the respective conveyors 1, 2, rotating the lower sprockets 3, 5 and the upper sprockets 13, 15 in opposite directions to each other, and the mat M is admitted between the conveyors 1, 2, and is conveyed therebetween while the opposite surfaces of the mat M are held between the surfaces 111, 121 of the caterpillar plates of the respective forward runs 11a, 21a. The speed of conveyance is variably controlled by the reduction gearing 23, which drives the conveyors 1, 2, in accordance with the material and the thickness of the mat M.

The hot air delivered from the heated blower unit 35 is pumped from the high pressure blowing box 33 dis-

posed within the upper conveyor 2 through the ventilation openings 10 in the caterpillar plates of the forward run 21a to pass through the mat M being conveyed, thus drying and curing it. After working against the mat M, the hot air which then obtains a reduced temperature and a reduced pressure is then fed through the ventilation openings 10 formed in the caterpillar plate of the forward run 11a into the low pressure blowing box 34 disposed within the lower conveyor 1 to be returned to the heated blower unit 35, whereupon the air is again heated by the blower unit 35 to be pumped to the high pressure blowing box 33 associated with the lower conveyor 1, thus circulating through the hot air supply system.

During the drying/curing step, the space delineated by the high pressure and the low pressure blowing boxes 33, 34 and the caterpillar plates of the respective forward runs 11a, 21a is shielded by the first wire brushes 41 associated with the upper conveyor 2, and selected ones of the first to the third wire brushes 41, 240 and 340 associated with the lower conveyor 1, and hence the effective width of the mat M is determined by the shielded width across corresponding ones of the reinforcing ribs 211c, 11c', 11c", 111c' and 111c" on the caterpillar plates of the forward run 11a of the lower conveyor 1 against which the selected ones of the first to the third wire brushes 41, 240, 340 associated with the lower conveyor 1 abut.

In addition, during the drying/curing step of the mat M, powder and particles (dusts) which may be produced from the surface of the mat M as a result of the drying/curing process will find its way into the air gaps contained in the wire brushes 41, 240, 340 to be trapped therein. Accordingly, these wire brushes 41, 240, 340 themselves provide a self-sealing action to block a leakage of such powder or particles to the outside while simultaneously preventing the ingress of such dusts into the oven 30, thus mitigating the need for a maintenance operation of the apparatus. In addition, since air gaps contained in the wire brushes 41, 240, 340 are filled with powder or particles to improve the sealing performance, a constant pressure of the hot air can be assured around the full perimeter of the mat, thus allowing an even drying/curing upon completion of the conveyance. This enhances the thermal efficiency and allows a reduction in the cost involved.

In the embodiment described above, two rows of movable wire brushes constitute the second and the third wire brush 240, 340, but it should be understood that the provision of wire brushes is not limited thereto, but that a plurality of rows, more than two, of wire brushes may be provided depending on the size of the manufacturing apparatus and disposed as displaced inwardly of the first wire brushes at successively offset crosswise positions so as to avoid an interference therebetween while extending along the direction of conveyance and rocked independently of other rows by associated rocking assemblies to achieve a similar effect.

In the described embodiment, the wire brushes have been chosen as the flexible caulking member, but it should be understood that such member is not limited thereto, but may comprise any fibrous body which has a heat resistance and which exhibits a self-sealing function.

Further, in the above-described embodiment, the wire brushes have been chosen, but may be replaced by waved wire brushes whose wires are formed in metal and have the shape of a wave. Using waved wire brushes improves their trap performance.

In addition, when the hot air which is pumped from the heated blower unit has a low temperature, the wire brushes may be replaced by nylon wire brushes.

While the embodiment has been mentioned above in connection with a mat for building purpose such as a mat of fibrous or powder material, the invention is not limited thereto, but is equally applicable to a non-dry material such as thermosetting resin.

While the invention has been disclosed above in connection with a preferred embodiment thereof, it should be understood that a number of changes, modifications and substitutions therein will readily occur to one skilled in the art from the above disclosure without departing from the scope of the invention defined by the appended claims.

Claims

1. A method of manufacturing a mat (M) for building purpose including steps of conveying a mat by holding it sandwiched between a pair of upper (2) and lower (1) conveyors, feeding a hot air from a flower source (35) to one of blowing boxes (33, 34) disposed above or below the conveying surface of the lower or upper conveyor during the conveyance of the mat, and passing the hot air through the upper (2) and the lower (1) conveyor and through the mat (M) which is held therebetween and thence to another blowing box (34) for circulation, thereby drying/curing the mat; providing a caulking member disposed between the conveyor (1) and the blowing box (34) for trapping powder or particles which may be developed during the drying/curing step, the caulking member including stationary caulking members (41) disposed outside the path of conveyance and a movable flexible caulking member (240) disposed inward of the stationary caulking members (41), the movable flexible caulking member (240) being displaceable between a shield position and a non-shield position to provide a variable shielded width;
characterized in that
the method includes providing a plurality of movable flexible caulking members (240, 340) disposed inward of the stationary caulking members (41), each of the plurality of movable flexible caulk-

ing members (240, 340) being independently displaceable between a shield position and a non-shield position to provide a variable shielded width.

2. An apparatus for manufacturing a mat for building purpose comprising

a conveyor mechanism (A) for conveying a mat (M), the conveyor mechanism including a pair of upper (2) and lower (1) conveyors, each conveyor comprising a pair of endless chains (7, 8; 17, 18) extending across sprockets (3, 4, 5, 6; 13, 14, 15, 16), with a plurality of caterpillar plates (11) having ventilation openings (10) perforated therein mounted to extend across the pair of chains (7, 8; 17, 18), the mat being conveyed by being held between both conveyors,

a heating and blowing mechanism (B) for heating the mat to dry/cure it as it is being conveyed by the upper (2) and lower (1) conveyors received in an oven (30), the heating and blowing mechanism including blowing boxes (33, 34) which are disposed in the oven (30) at locations above and below the caterpillar plates (11) of the respective forward runs of the lower and the upper conveyors (1,2) so that hot air from a heated source is delivered from one of the blowing boxes (33) to pass through the caterpillar plates (11) of the respective forward runs and through the mat (M) being conveyed into another blowing box (34) to achieve a drying/curing of the mat.

a shield mechanism (C) inlcuding caulking members disposed between the caterpillar plates (11) of the respective forward runs and the heating and blowing mechanism (B) for preventing a leakage of the hot air, the shield mechanism (C) including stationary caulking members (41) disposed to abut against the lateral sides of the caterpillar plates (11) of the respective forward runs and extending around the blowing boxes (33, 34) along the direction of conveyance, and a movable flexible caulking member (240) disposed inward of the stationary caulking members (41) and extending along the direction of conveyance and movable toward and away from abutment against the caterpillar plates (11) of the forward runs,

and a shielded width selection mechanism (250, 251, 252, 253, 254,) for operating the movable flexible caulking member (240) for movement toward or away from abutment against the caterpillar plates (11) of the forward runs to provide a variable shielded width, thereby allowing a drying/curing of the mat to a selectable effective width;

characterized in that

the shield mechanism includes a plurality of rows of movable flexible caulking members (240, 340) disposed inward of the stationary caulking members (41) at different crosswise positions and extending along the direction of conveyance and movable toward and away from abutment against the caterpillar plates (11) of the forward runs,

the shielded width selection mechanism (250-254; 350-354) being operable to cause an independent operation of the plurality of rows of movable flexible caulking members (240, 340), a shielded width being determined by stationary (41) and movable (240, 340) caulking members abutting against the caterpillar plates (11) of the forward runs at innermost positions.

3. An apparatus according to Claim 2 in which the shielded width selection mechanism comprises a plurality of rocking assemblies (250, 350), each operable to rock one of the plurality of rows of movable flexible caulking members (240, 340) independently for movement toward or away from abutment against the caterpillar plates (11) of the forward runs.

4. An apparatus according to Claim 3 in which each of the rocking assemblies (250, 350) comprises an actuator (251, 351), a rod (252, 352) connected to the actuator and extending through the oven (30) and reciprocable crosswise of the lower conveyor (1), a rocking arm (253, 353) rockably connected to the rod and fitted over an arm shaft (253b, 353b), and a rocking plate (254, 354) connected to the arm shaft (253b, 353b) through a support member (253c, 353c) so as to be intergrally movable with the rocking arm (253, 353) and extending along the direction of conveyance, the rodking plate (254, 354) carrying the movable flexible caulking member (240, 340) on its top end.

5. An apparatus according to Claim 2, 3 or 4 in which the flexible caulking member (41, 240, 340) comprises a wire brush.

Patentansprüche

1. Verfahren zur Herstellung einer Matte (M) für Bauzwecke, umfassend die Schritte eines Förderns einer Matte, indem diese zwischengelegt zwischen zwei Fördermitteln, einem oberen (2) und einem unteren (1), gehalten wird, Zuführen von Heißluft aus einer Gebläsequelle (35) zu einem der Gebläsekästen (33, 34), die über oder unter der Förderoberfläche des unteren oder oberen Fördermittels wäh-

rend des Transports der Matte angeordnet sind, und Strömen der Heißluft durch das obere (2) und das untere Fördermittel und durch die Matte (M), die dazwischen gehalten wird, und von dort zu einem anderen Gebläsekasten (34) zur Zirkulation, wodurch die Matte getrocknet/ausgehärtet wird; Vorsehen eines Abdichtungselements, das zwischen dem Fördermittel (1) und dem Gebläsekasten (34) zum Auffangen von Pulver oder Partikeln angeordnet ist, das bzw. die während des Trocknungs-/Aushärtungsschritts entwickelt werden können, wobei das Abdichtungselement feststehende Abdichtungselemente (41), die außerhalb des Förderwegs angeordnet sind, und ein bewegliches flexibles Abdichtungselement (240) umfaßt, das nach innen gerichtet von den feststehenden Abdichtungselementen (41) angeordnet ist, wobei das bewegliche flexible Abdichtungselement (240) versetzbar zwischen einer Abschirmungsposition und einer nicht abschirmenden Position ist, um eine veränderliche abgeschirmte Breite zu schaffen;
dadurch gekennzeichnet, daß
das Verfahren ein Vorsehen einer Vielzahl an beweglichen flexiblen Abdichtungselementen (240, 340) umfaßt, die nach innen gerichtet von den feststehenden Abdichtungselementen (41) angeordnet sind, wobei jedes der Vielzahl an beweglichen flexiblen Abdichtungselementen (240, 340) unabhängig zwischen einer Abschirmungsposition und einer nicht abschirmenden Position versetzbar angeordnet ist, um eine veränderliche abgeschirmte Breite zu schaffen.

2. Vorrichtung zur Herstellung einer Matte für Bauzwecke, umfassend

einen Fördermechanismus (A) zum Fördern einer Matte (M), wobei der Fördermechanismus zwei Fördermittel, ein oberes (2) und ein unteres (1), umfaßt, wobei jedes Fördermittel zwei sich über Kettenzahnräder (3, 4, 5, 6; 13, 14, 15, 16) erstreckende Endlosketten (7, 8; 17, 18) umfaßt, mit einer Vielzahl an Raupenplatten (11) mit darin perforierten Belüftungsöffnungen (10), die montiert sind, sich über das Kettenpaar (7, 8; 17, 18) zu erstrecken, wobei die Matte gefördert wird, indem sie zwischen beiden Fördermitteln gehalten wird,

einen Heiz- und Blasmechanismus (B) zum Erhitzen der Matte, um diese zu trocknen/auszuhärten, während diese durch das obere (2) und untere (1) Fördermittel gefördert und in einem Ofen (30) aufgenommen wird, wobei der Heiz- und Blasmechanismus Gebläsekästen (33, 34) umfaßt, die in dem Ofen (30) an Orten über und unter den Raupenplatten (11) der jeweiligen Vorwärtsläufe des unteren und des oberen Fördermittels (1, 2) angeordnet sind, so daß Heißluft von einer Heizquelle von einem der Gebläsekästen (33) angeliefert wird, um durch die Raupenplatten (11) der jeweiligen Vorwärtsläufe und durch die Matte (M) zu strömen, die in einen anderen Gebläsekasten (34) gefördert wird, um ein Trocknen/Aushärten der Masse zu erzielen.

einen Abschirmungsmechanismus (C), der Abdichtungselemente umfaßt, die zwischen den Raupenplatten (11) der jeweiligen Vorwärtsläufe und dem Heiz- und Blasmechanismus (B) angeordnet sind, um eine Leckage der Heißluft zu verhindern, wobei der Abschirmungsmechanismus (C) feststehende Abdichtungselemente (41) umfaßt, die angeordnet sind, gegen die seitlichen Seiten der Raupenplatten (11) der jeweiligen Vorwärtsläufe anzustoßen, und sich um die Gebläsekästen (33, 34) entlang der Förderrichtung erstrecken, und ein bewegliches flexibles Abdichtungselement (240), das nach innen gerichtet von den feststehenden Abdichtungselementen (41) angeordnet ist und sich entlang der Förderrichtung erstreckt und gegen und von einem Widerlager gegen die Raupenplatten (11) der Vorwärtsläufe weg beweglich ist,

und einen Auswahlmechanismus für die abgeschirmte Breite (250, 251, 252, 253, 254) zum Betreiben des beweglichen flexiblen Abdichtungselements (240) zum Bewegen gegen und weg von einem Widerlager gegen die Raupenplatten (11) der Vorwärtsläufe, um eine veränderliche abgeschirmte Breite vorzusehen, wodurch ein Trocknen/Aushärten der Matte in einer auswählbaren effektiven Breite gestattet wird;

dadurch gekennzeichnet, daß

der Abschirmungsmechanismus eine Vielzahl an Reihen aus beweglichen flexiblen Abdichtungselementen (240, 340) umfaßt, die nach innen gerichtet von den feststehenden Abdichtungselementen (41) an unterschiedlichen kreuzweisen Positionen angeordnet sind und sich entlang der Förderrichtung erstrecken und beweglich gegen und weg von einem Widerlager gegen die Raupenplatten (11) der Vorwärtsläufe sind,

wobei der Auswahlmechanismus für die abgeschirmte Breite (250 - 254; 350 - 354) betreibbar ist, um einen unabhängigen Betrieb der Vielzahl an Reihen aus beweglichen flexiblen Abdichtungselementen (240, 340) zu verursa-

chen, wobei eine abgeschirmte Breite durch feststehende (41) und bewegliche (240, 340) Abdichtungselemente bestimmt wird, die gegen die Raupenplatten (11) der Vorwärtsläufe an innersten Positionen anstoßen.

3. Vorrichtung nach Anspruch 2, bei der der Auswahlmechanismus für die abgeschirmte Breite eine Vielzahl an Schwenkanordnungen (250, 350) umfaßt, wobei jede betreibbar ist, eine der Vielzahl an Reihen aus beweglichen flexiblen Abdichtungselementen (240, 340) unabhängig zur Bewegung gegen oder weg von einem Widerlager gegen die Raupenplatten (11) der Vorwärtsläufe zu schwenken.

4. Vorrichtung nach Anspruch 3, bei der jede der Schwenkanordnungen (250, 350) ein Betätigungsorgan (251, 351) umfaßt, eine Stange (252, 352), die an das Betätigungsorgan angeschlossen ist und sich durch den Ofen (30) erstreckt und kreuzweise hin- und herbewegbar an dem unteren Fördermittel (1), einen Schwenkarm (253, 353), der schwenkbar an die Stange angeschlossen ist und über eine Armwelle (253b, 353b) angebracht ist, und eine Schwenkplatte (254, 354), die an die Armwelle (253b, 353b) durch ein Stützelement (253c, 353c) angeschlossen ist, um so integral beweglich mit dem Schwenkarm (253, 353) zu sein und sich entlang der Förderrichtung zu erstrecken, wobei die Schwenkplatte (254, 354) das bewegliche flexible Abdichtungselement (240, 340) an seinem oberen Ende trägt.

5. Vorrichtung nach Anspruch 2, 3 oder 4, bei der das flexible Abdichtungselement (41, 240, 340) eine Drahtbürste umfaßt.

Revendications

1. Procédé de fabrication d'un tapis (M) à des fins de construction comprenant les étape consistant à transporter un tapis en le maintenant pris en sandwich entre une paire de dispositifs de transport supérieur (2) et inférieur (1), délivrer de l'air chaud à partir d'une source de soufflage (35) sur une des boîtes de soufflage (33, 34) disposées au-dessus ou au-dessous de la surface de transport du dispositif de transport supérieur ou inférieur pendant le transport du tapis et à faire passer l'air chaud à travers le dispositif de transport supérieur (2) et inférieur (1) et à travers le tapis (M) qui est maintenu entre ceux-ci, et ainsi, vers une autre boîte de soufflage (34) à des fins de circulation, séchant/durcissant de ce fait le tapis ; prévoir un élément de matage disposé entre le dispositif de transport (1) et la boîte de soufflage (34) pour piéger la poudre ou les particules qui peuvent être développées pendant l'étape de séchage/cuisson, l'élément de matage comprenant des éléments de matage fixes (41) disposés à l'extérieur du trajet de transport et un élément de matage flexible déplaçable (240) disposé vers l'intérieur des éléments de matage fixes (41), l'élément de matage flexible déplaçable (240) étant déplaçable entre une position de protection et une position de non protection afin de procurer une largeur protégée variable ;
caractérisé en ce que
le procédé comprend la fourniture d'une pluralité d'éléments de matage flexibles déplaçables (240, 340) disposés vers l'intérieur des éléments de matage fixes (41), chacun de la pluralité des éléments de matage flexibles déplaçables (240, 340) étant déplaçables indépendamment entre une position de protection et une position de non protection afin de procurer une largeur protégée variable.

2. Appareil pour fabriquer un tapis à des fins de construction comprenant

un mécanisme de transport (A) pour transporter un tapis (M), le mécanisme de transport comprenant une paire de dispositifs de transport supérieur (2) et inférieur (1), chaque dispositif de transport comprenant une pai-re de chaînes sans fin (7, 8 ; 17, 18) s'étendant à travers des roues dentées (3, 4, 5, 6 ; 13, 14, 15, 16), avec une pluralité de plaques-chenilles (11) ayant des ouvertures de ventilation (10) perforées dans celles-ci montées pour s'étendre à travers la paire de chaînes (7, 8 ; 17, 18), le tapis étant transporté tout en étant maintenu entre les deux dispositifs de transport,
un mécanisme de chauffage et de soufflage (B) pur chauffer le tapis afin de le sécher/durcir à mesure qu'il est transporté par les dispositifs de transport supérieur (2) et inférieur (1) et reçu dans un four (30), le mécanisme de chauffage et de soufflage comprenant des boîtes de soufflage (33, 34) qui sont disposées dans le four (30) à des emplacements au-dessus et au-dessous des plaques-chenilles (11) des trajets avant respectifs des dispositifs de transport inférieur et supérieur (1, 2) de sorte que l'air chaud provenant de la source chauffée est délivrée à partir d'une des boîtes de soufflage (33) pour passer à travers les plaques-chenilles (11) des trajets avant respectifs et à travers le tapis (M) qui est transporté dans une autre boîte de soufflage (34) pour obtenir un séchage/cuisson du tapis.
un mécanisme de protection (C) incluant des éléments de matage disposés entre les plaques-chenilles (11) des trajets avant respectifs et le mécanisme de chauffage et de soufflage (B) pour empêcher une fuite de l'air chaud, le

mécanisme de protection (C) incluant des éléments de matage fixes (41) disposés pour venir en butée contre les côtés latéraux des plaques-chenilles (11) des trajets avant respectifs et s'étendant autour des boîtes de soufflage (33, 34) le long de la direction de transport et un élément de matage flexible déplaçable (240) disposé vers l'intérieur des éléments de matage fixes (41) s'étendant le long de la direction du transport et déplaçable en butée vers et à l'opposé des plaques-chenilles (11) des trajets avant,
un moyen de sélection de largeur protégée (250, 251, 252, 253, 254) pour actionner l'élément de matage flexible déplaçable (240) pour déplacement en butée ou à l'opposé contre les plaques-chenilles (11) des trajets avant afin de procurer une largeur protégée variable, permettant de ce fait un séchage/cuisson du tapis à une largeur effective sélectionnable ;

caractérisé en ce que
le mécanisme de protection comprend une pluralité de rangées d'éléments de matage flexibles déplaçables (240, 340) disposés vers l'intérieur des éléments de matage fixes (41) à des positions dans le sens transversal différentes et s'étendant le long de la direction du transport et déplaçables vers et à l'opposé de la butée contre les plaques-chenilles (11) des trajets avant, le mécanisme de sélection des largeurs protégées (250 à 254 ; 350 à 354) pouvant être mis en oeuvre pour entraîner une opération indépendante de la pluralité de rangées des éléments de matage flexibles déplaçables (240, 340), une largeur protégée étant déterminée par les éléments de matage fixes (41) et déplaçables (240, 340) venant en butée contre les plaques-chenilles (11) des trajets avant aux positions les plus à l'intérieur.

3. Appareil selon la revendication 2, dans lequel le mécanisme de sélection de largeur protégée comprend une pluralité d'ensembles basculants (250, 350), chacun pouvant être mis en oeuvre pour basculer une rangée de la pluralité des rangées des éléments de matage flexibles et déplaçables (240, 340) indépendamment pour déplacement vers ou à l'opposé de la butée contre les plaques-chenilles (11) des trajets avant.

4. Appareil selon la revendication 3, dans lequel chacun des ensembles basculants (250, 350) comprend un organe de commande (251, 351), une tige (252, 352) raccordée à l'organe de commande et s'étendant à travers le four (30) et déplaçable en va et vient dans le sens transversal du dispositif de transport inférieur (1), un bras basculant (253, 353) raccordé de manière basculante à la tige adaptée sur un bras d'arbre (253b, 353b) et une plaque basculante (254, 354) connectée au bras d'arbre (253b, 353b) à travers un élément de support (253c, 353c) de façon à être solidairement déplaçable avec le bras basculant (253, 353) et s'étendant le long de la direction du transport, la plaque basculante (254, 354) supportant l'élément de matage flexible déplaçable (240, 340) sur son extrémité supérieure.

5. Appareil selon la revendication 2, 3 ou 4, dans lequel l'élément de matage flexible (41, 240, 340) comprend une brosse à fils.

FIG.1

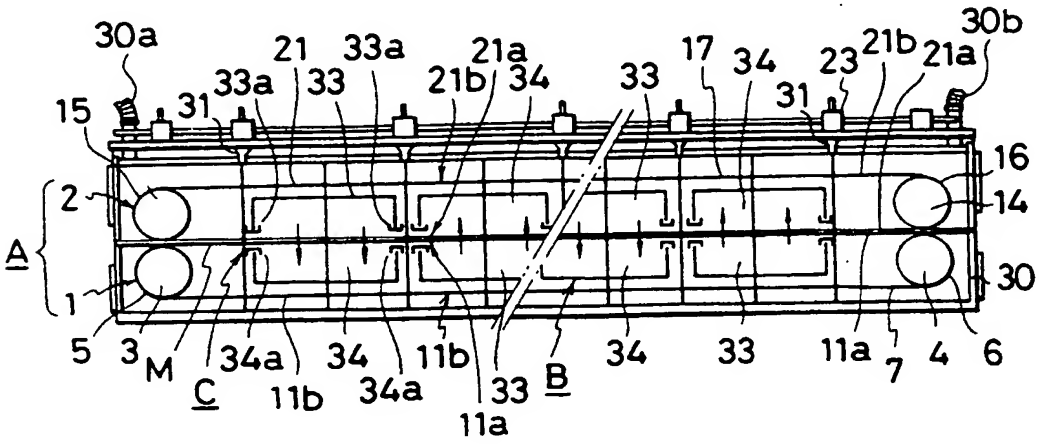

30a
21
33a
21a
17
34
23
21b
21a
30b
15
31
33a
33
21b
34
33
31
16
2
14
A
30
1
5
3
M
34a
34
11b
33
34
33
11a
7
4
6
C
11b
34a
11a
B

FIG.2

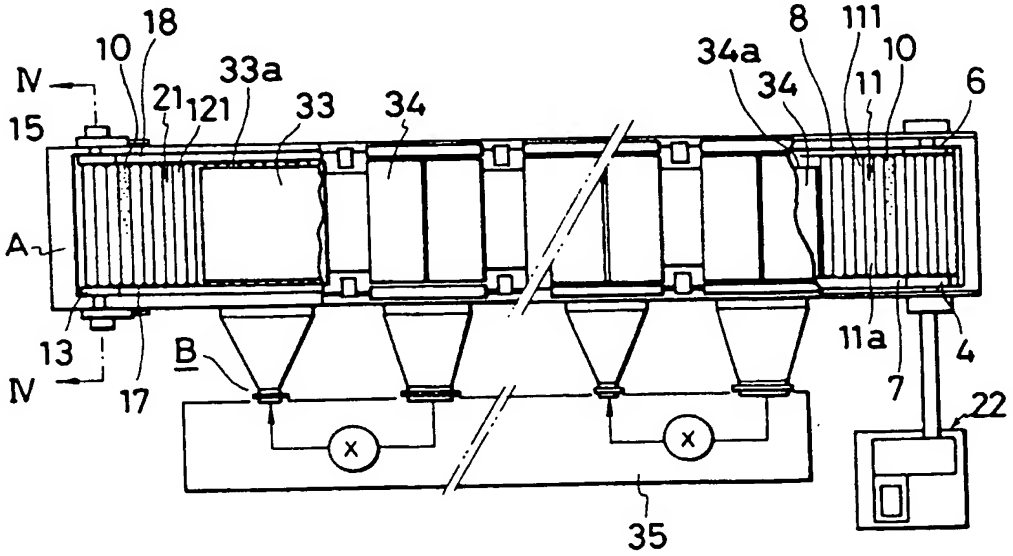

18
10
8
111
34a
10
N
33a
34
11
6
21
121
33
34
15
A
13
B
11a
4
N
17
7
22
35

FIG.3

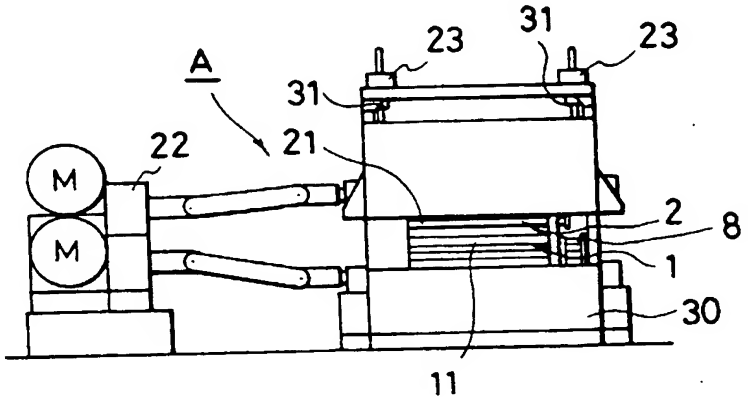

A
22
21
31
23
31
23
M
M
2
8
1
30
11

FIG.5

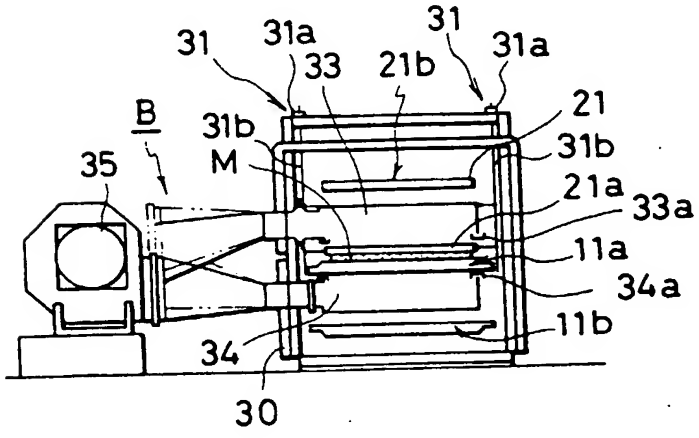
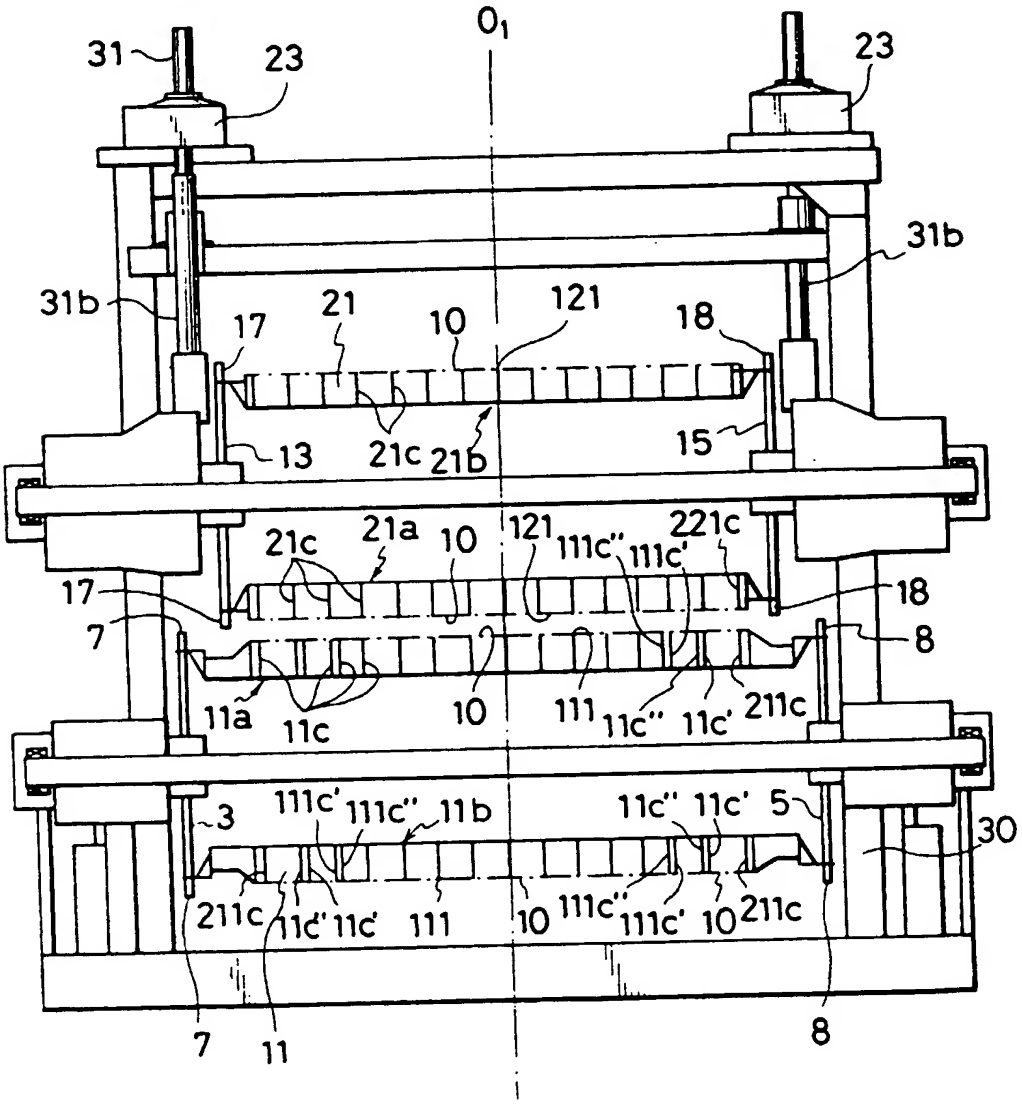

31
31a
33
21b
31
31a
B
31b
M
35
21
31b
21a
33a
11a
34a
11b
34
30

FIG.4


O1
31
23
23
31b
31b
17
21
10
121
18
13
21c
21b
15
21c
21a
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121
111c"
111c'
221c
17
18
7
8
11a
11c
10
111
11c"
11c'
211c
3
111c'
111c"
11b
11c"
11c'
5
30
211c
11c'
11c'
111
10
111c"
111c'
10
211c
7
11
8

FIG. 6

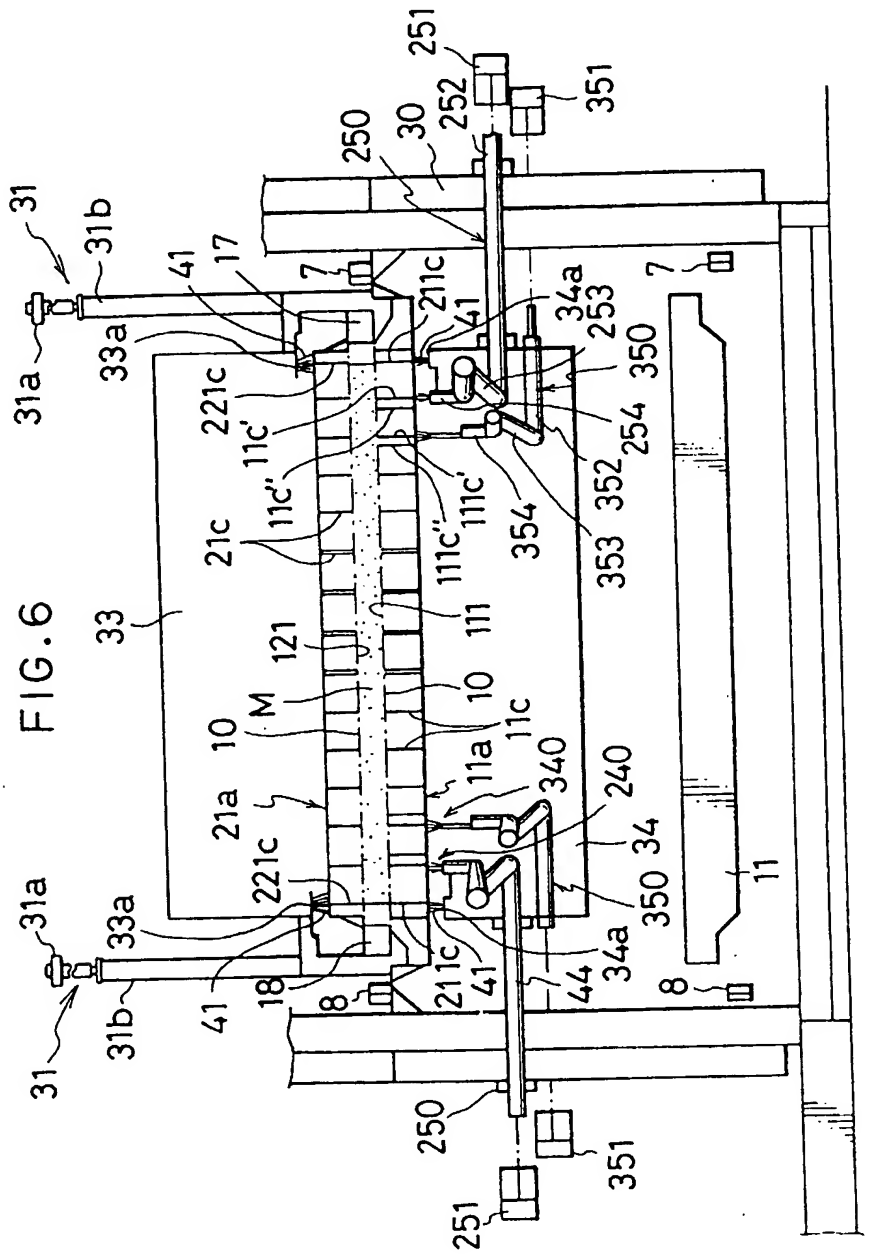

31
31b
31a
33a
41
17
7
211c
41
34a
253
350
221c
11c'
11c''
111c'
111c''
254
352
354
353
21c
33
111
121
10
M
11a
340
240
34
11
21a
18
8
44
250
30
252
351
251

FIG. 7

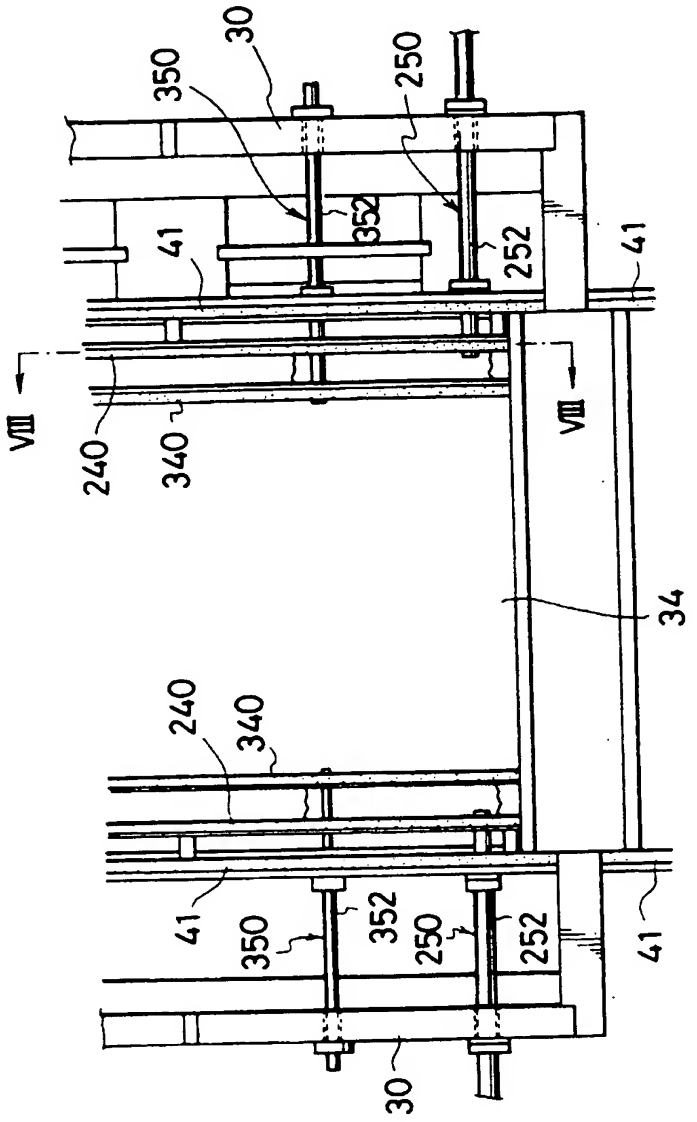
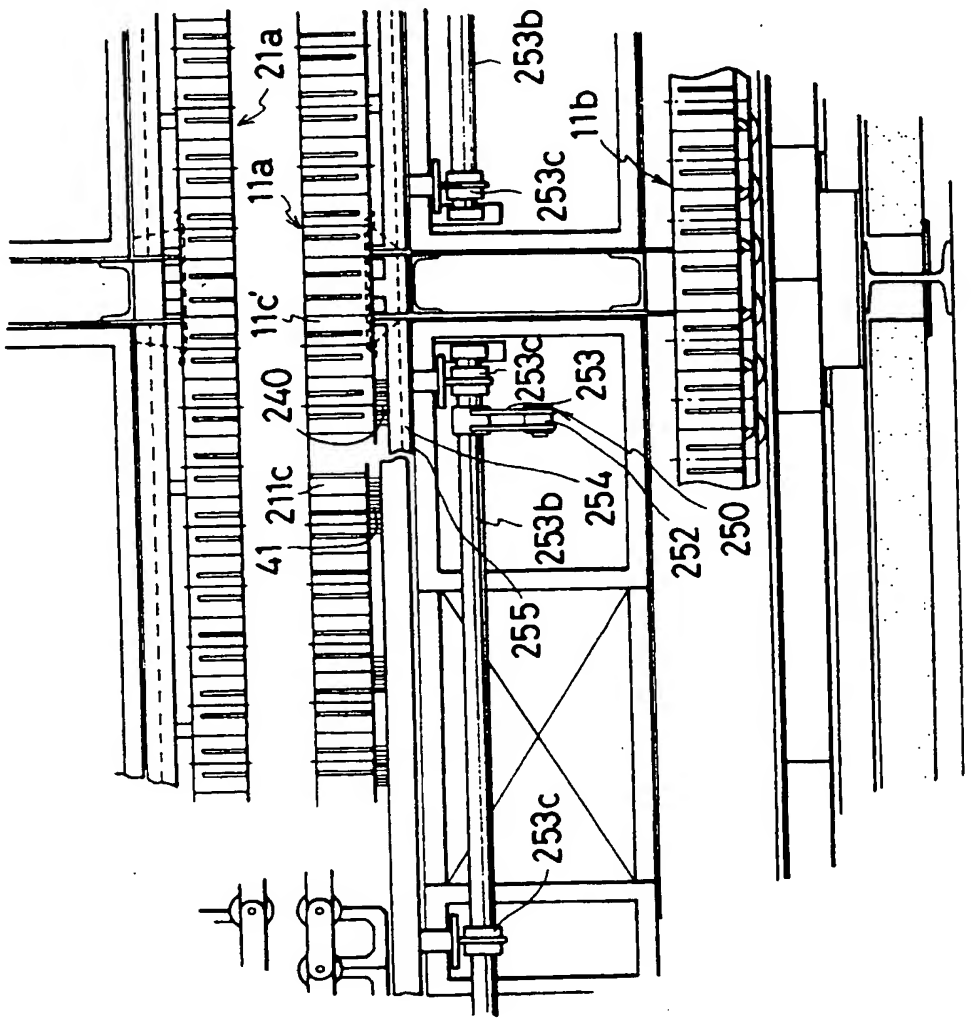

30
350
250
352
41
252
41
VIII
VIII
240
340
34
240
340
41
350
352
250
252
41
30

FIG.8



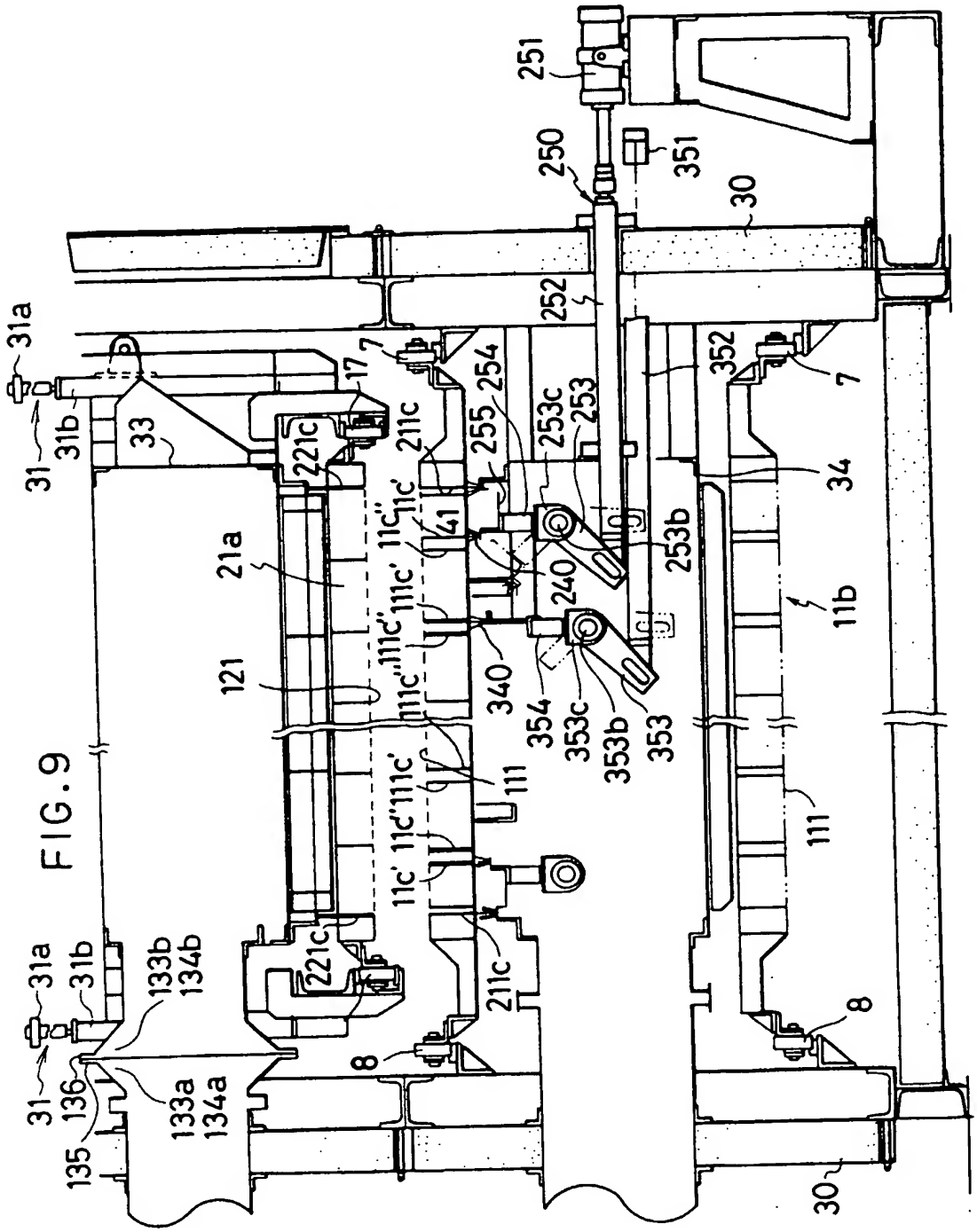

251
250
351
30
252
352
7
31a
31
31b
33
17
254
253c
253
255
221c
211c
34
11c'
11c''
41
253b
21a
240
111c'
111c''
11b
121
340
354
353c
353b
353
111
111c'
11c'
11c''
111
31a
31b
133b
134b
221c
211c
8
31
136
133a
134a
135
30

FIG. 9